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so, as that the heat is conveyed to all parts of the bottom and sides of the Furnace. Then whereas they were wont to pump cold Liquor into the Boyler to supply the waste in boyling, whereby the Boyler was checked some times ten hours: Sir *Nicolas* hath now a Vessel of Lead, which he calls a Heater, placed at the end of the Boyler, and a little higher, supported by Barrs of Iron as before, and fill'd with Liquor, which by a conveyance of heat from the Furnance, is kept near boyling hot: and so continually supplys the waste of the Boyler, without hindring the boyling. Thirdly, by putting in due proportions of Iron from time to time, into the Boyler. As soon as they perceive the Liquor to boyl slowly, they put in more Iron, which will soon quicken it.

Besides, if they do not continually supply the boyling Liquor with Iron, the *Copperas* will gather to the bottom of the Boyler and Melt. And so it will do, if the Liquor be not presently drawn off from the Boyler into a Cooler, so soon as it is enough.

The Cooler is oblong, twenty feet long, nine feet over at the top, five feet deep, taper'd towards the bottom, made of Tarras. Into this they let the Liquor run, so soon as it is boyled enough. The *Copperas* here-in will be gathering or shooting fourteen or fifteen days: and gathers as much on the sides as in the bottom; *sc.* above five inches thick. Some put Bushes into the Cooler, about which the *Copperas* will gather. But at *Deptford* they make not use of any.

That which sticks to the sides, and to the Bushes, is of a bright green, that in the bottom, of a foul and dirty colour.

In the end of fourteen days, they convey the Liquor into an other Cooler, and reserve it to be boyl'd again with new Liquor.

The *Copperas* they shovel on a Floor adjoining, so that the Liquor may drain from it into a Cooler.

The steam which comes from the boyling is of an acrimonious smell.

*Copperas* may be boyled without Iron, but with difficulty. Without it, the Boyler will be in danger of melting.

Sometimes in stirring the Earth on the Beds, they find pieces of *Copperas* produced by lying in the Sun.

*An Account of the Salt Waters of Droytwich in Worcestershire; sent by Dr. William Cole from Dr. Tho. Rastell, who hath lived many years upon the place, and hath there several Phats of his own*

SIR,

HAVING heretofore seen in some of the Transactions of the Royal Society, Queries concerning the Salt-Springs in *Cheshire*, and not hearing of any account hath been given them of ours in *Worcestershire*, (which I hoped some more ingenious Pen would have done before this time); to satisfy the desire of some friend, I have made as exact trials of our Brine as I could, that I might be able in some measure to give an Answer to the *Cheshire* Queries, which if they are not answered

ed so fully as expected, in what I am deficient (if I may know) I shall be ready to give an Answer; in the mean time I hope my Endeavours will be accepted, and I Pardon'd.

*Quer. 1.* What kind of Country it is where the Springs are, and what places grow about them?

*Ans.* The Country, is neither plain, neither hath it any great Hills, but many small risings, the greatest Hills near us being the *Lichie* within six miles, which some call *Look high*, supposing it to be the highest ground in these parts, because the Springs that rise there, run into the North and South Seas; near to which are *Clent* Hills about the same distance. On the other side the River *Severn* are *Aberly* Hills at about seven miles distance from us. There are many Salt Springs about the Town, which is seated by a Brook-side called *Salwarp*-Brook, which arise both in the Brook and in the ground near it, though there are but three Pits that are made use of.

For the Plants growing about the Springs I find no other varieties then in other places, but where the Springs are saltest there grows nothing at all, but by the brackish Ditches there grows *After Atticum* with a pale Flower, which I find no where else with us.

*Quer. 2.* What is the depth of the Salt Springs?

*Ans.* The depth of them is various, some rise on the top of the ground which are not so salt as others: those that are in the Pits we make use of are various also. The great Pit which is called *Upwich* Pit is 30 foot deep in which are three distinct Springs rising in the bottom, one comes into the Pit North-West, another North-East, the third South-East, which is the richest both in quantity and quality: they all differ in saltness, which I can give no exact account of, it being impossible to separate them but there will be some mixture; The Pit is about 10. foot square, the sides are made with square Elms joynted in at the full length, which I suppose is occasioned by the saltness of the ground which appears to me to have been a Bog, the surface of it is made of ashes. That it was originally a Bog I am induced to believe, for not many years since digging to try the foundation of a Seal (for so we call our houses we make Salt in) I thrust a long Staff over head.

*Quer. 3.* Whether there are any hot Springs near? and whether the waters of the Salt Springs be colder then other water?

*Ans.* There are no hot Springs near us: for the coldness of the brine it is generally colder than other water, yet it never freezeth, but the rain water that lyes upon the brine (in extream hard Frosts) will freez, but not much.

*Quer. 4.* What kind of Earth it is? and in digging whether there are any Shells?

*Ans.* For Shells I never observed nor heard of any. For the nature of the Soil about the Town on the lower side it is a black rich Earth, under which

which two or three foot is a stiff gravelly Clay, then Marle. Those that make Wells for fresh Water, if they find Springs in the Marle, they are generally fresh, but if they sink through the Marle, they come to a whitish Clay mixed with Gravel, in which the Springs are more or less brackish.

*Quer. 5.* How strong the Water is of Salt? and what quantity of Brine the Pits yeild?

*Ans<sup>w</sup>.* In the great Pit at *Upwich*, we have at one and the same time three sorts of Brine, which we call by the names of First-man, Middle-man, and Last-man, these sorts are of different strengths; The Brine is drawn by Pump, for that which is in the bottom is first pumped out, which is that we call first man, &c. That I might make an exact trial of the strength, I made me a quart that contained 24. ounces *Troy*, of distilled water, which quart being filled with the first Brine besides the tare of the quart weighed 29. ounces, which made 7. ounces and 3. drachms of Salt without any addition; the next day I weighed the same Salt again, and it weighed 7. ounces and 6. drachms, by which it appears this Brine yields above a fourth part Salt; so that 4 Tuns of Brine make above one Tun of Salt. The same quart filled with Middle-man, which is the second sort of Brine, weighed 28. ounces, I also weighed a quart of Brine as it came immediately out of the Springs which weighed 28. ounces and the third sort 27. ounces, so that what the first gets the last looseth, which doth precipitate as much in 24. hours as if it stood much longer time.

The quantity of Brine that this Pit yields every 24. hours is as much as will make 450. Bushels of Salt, which is drawn out twice or three times a day, for so oft we ordinarily draw, and that as long as the Pump will goe.

In the best Pit at *Netherwich* a quart of Brine weighs 28. ounces and a half, this Pit is 18. foot deep, and four foot broad, and yields as much Brine every 24. hours as makes about 40. Bushels of Salt, there is but one Spring in the Pit that comes in 2. foot and 8. inches above the bottom.

The worst Pit at *Netherwich* is of the same breadth and depth as the former, a quart of Brine out of which weigheth 27. ounces and yields as much Brine dayly as makes about 30. bushels of Salt: in this Pit are three Springs, two in the bottom, and one about two foot higher; these Pits are within six yards one of another.

These Pits are near the *Brook*, the great Pit on the North side, and about a quarter of a mile lower the two lesser Pits on the South side.

*Quer. 6.* Whether the Springs yield more or less Brine at one time than at another?

*Ans<sup>w</sup>.* In the great Pit I find little or no variation, either in quality or strength of the Brine, but the Springs in the other Pits are augmented by much rain, and yield less Salt.

*Quer.* 7. What is the manner of their work? whether there is any thing used to make the Salt granulate? and what it is?

*Ans.* For the manner of our Work, that every man may know his own proportion, the Brine is divided into Phats wallings, a Phat walling is divided into 12. weaker Brines, and every weaker Brine is divided into 8. burdens, every burden being a Vessel that contains about 32. Gallons, whereof every one hath 6. burden of First-man, 6. of Middle-man, and 6. of Last-man, so that every man hath not only his just proportion in quantity, but in quality also. This Brine is carried in Coolers to every mans Seal, by 8. sworn men, which we call Masters of the Beachin, and 4. Middle-men, and there put into great Tuns for use

The fuel which was heretofore used was all wood, which since the Iron-works, is so destroyed that all the Wood at any reasonable distance will not supply the Works one quarter of the year, so that now we use almost all Pit-Coals which are brought to us by Land 13. or 14. miles.

For the Phats we boil our Brine in, they are made of Lead cast into a flat plate 5. foot and a half long, and 3. foot over, and then the sides and ends beaten up, and a little rais'd in the middle, which are set upon Brick-work which we call Ovens, in which is a Grate to make the Fire on, and an Ash-hole which we call a Trunk; in some Seals are six of these Pans, in some 5. some 4. some 3. some 2. In each of these Pans is boil'd at a time as much Brine as makes 3 pecks of white Salt, which we call a Lade; and is laded out of the Pan with a Loote, which is a pannel board put slope-ways, on a staff about 3 foot Long; and put into Barrows, which are set in Bastalls over vessels we call Leachcoms, that the Brine may run from the Salt, which Brine we call Leach, with which we dress our Phats when the cold Brine they first filled with is something boil'd away, In these Bastalls the Salt stands till it is dry which is about four hours, then we carry it into Cribs (which are houses boarded in the bottom and sides) where it is kept till Sold, which is sometimes half a year or 3. quarters; in which time if the Crib is good, it will not waste a twelfth part, the Salt it self being of so strong a body, whereas in *Cheshire* they are forced to keep their Salt in Barrows in Stoves to dry it and make it no faster then they sell.

For clarifying our Salt we should have little need, were it not for dust accidentally falling into the Brine. The Brine of it self being so clear that nothing can be clearer: for clarifying it we use nothing but the Whites of Eggs, of which we take a quarter of a White, and put it into a gallon or two of Brine, which being beaten with ones hand, lathers as if it were Soap, a small quantity of which froth put into each Phat, raiseth all the scum, (so that the White of one Egg will clarify 20. bushels of Salt) by which means our Salt is as white as any thing can be, neither

ther hath it any ill favour, as that Salt hath that is clarified with booll.

For granulating it we use nothing at all, for the Brine is so strong of it self, that unless it be often stirred, it will make Salt as big grained as Bay-salt. I have boyl'd Brine to a Candy hight, and it hath produced clods of Salt as clear as the clearest Alum, like Isle of May Salt, so that we are necessitated to put a small quantity of Rosin into the Brine to make the grain of the Salt small.

*Quer. 8.* What are the severall sorts of Salt?

*Ans.* Besides the white Salt I have spoke of, we have another sort which we call Clod-Salt, which grows to the bottoms of the Phats that after the white Salt is laded out, is digged up with a picker (which is made like a Mafons Trowel, pointed with Steel and put upon a short staff) this is the strongest Salt I have seen, and is most used for salting Bacon and Neats Tongues, it makes the Bacon redder than other Salt, and makes the Fat eat firm: if the Swine are fed with Mast, it hardens the Fat almost as much as if fed with Pease, and salted with white Salt. It is very much used by Countrey women to put into their Runnet-Pots and (as they say) is better for their Cheese: these clods, are used to broil meat with being laid on coals, we account this Salt to be too strong to salt Beef with, it taking away too much of its sweetness.

A third sort of Salt we have which we call Knockings, which doth candy on the Stailles of the Barrow, as the Brine runs from the Salt after it is laded out of the Phats: this Salt is most used for the same uses as the clod Salt, though it is not altogether so strong.

A fourth sort we have which we call Scrapings, that is a course sort of Salt that is mixed with dross and dust that cleaves to the tops of the sides of the Phats, this Salt is scraped off the Phats when we reach them (that is when we take our Phats off the Fires to beat up the bottom) and is bought by the poor sort of people to salt meat with.

A fifth sort is Pigeon Salt, which is nothing but the Brine running out through the crack of a Phat, and hardens to a clod on the outside over the fire.

Lastly, the Salt Loaves are the finest of the white Salt, the grain of which is made something finer then ordinary that it may the better adhere together, which is done by adding a little more Rosin, and is beaten into the Barrows when it is laded out of the Phat.

*Quer. 9.* Whether our Salt be more or less apt to dissolve in the air than other Salt?

*Ans.* It is not so apt to dissolve, as *Cheshire* Salt, nor as that Salt that is made by dissolving Bay-Salt and clarifying it, which is called Salt upon Salt, which appears by our long keeping it without any fire. Whether it will keep better than French Salt I have made no trial, but I suppose it will, for such reasons I shall give in answer as to the goodness of our Salt.

*Quer.*

*Quer.* 10. Whether our Salt be as good to powder Beef or other Flesh as *French Salt*?

*Ans.* It is, and I believe there cannot be better white Salt then ours for several Reasons.

1. There is none can be whiter, and consequently more free from dross.

2. It is the weightiest as I have seen my self, and been informed by others, for the baggs of Salt I have usually seen brought out of *Cheshire* on Horseback, contain 6. bushels and a half or 7. bushels, whereas the best Horses that carry Salt from hence (if they carry it above 5. miles) carry not above 3. strike and 3. pecks, or 4. strike. A *Winchester* bushel of our Salt weighs half a hundred weight, so that it must necessarily follow, the weightiest and driest must needs be the best.

3. In the time of the first *Dutch-Warr*, our Salt was carried down into the West, where they had before none but forreign Salt, where at the first using ours, they complained that it made their meat too salt, which was because they put as much of ours on their meat as of others: if so, it must be better then *French Salt*. This account I had from him hat carried our Salt into those parts.

4. I have been assured by many that have made use both of ours, and *Cheshire Salt*, that both for Flesh and white-meat they must lay on more of *Cheshire Salt* then ours.

5. It doth preserve all sorts of Flesh for long Voyages, viz. to *Jamaica*, as well as any, which hath been lately tried.

6. I have seen Herrings that have been salted with our Salt in *Ireland*, and brought over to this Town, which have been whiter and better tasted than those salted with Bay Salt.

7. It is an ordinary way of powdering Beef with us, to give it but one Salting to keep it the whole year.

If it is asked why we use not Iron-Pans as in *Cheshire* and other places?

There have been tryals made both of forged Iron-Pans and cast-Iron. The former the strength of the Brine doth so corrode, that it quickly wears them out; the latter the Brine breaks.

SIR, If there is any thing more of which you desire an information, I shall (if I may know it) endeavour to inform you, that am

Droytwitch March  
the 16th. 1678.

Your humble Servant

THO. RASTEL.